Filaria perstans as the causative agent of sleeping sickness (p. 408). This view had prevailed in the text-books for some time, but the Royal Society's commission has shown at once that the facts will not support this view. These then are instances where a personal acquaintance of even a few months' duration of the disease under consideration has considerably modified received opinions. But we cannot always hope to have critical inquiries of this kind by trained observers. We are, unfortunately, left with the second much inferior method, viz. the diligent searching out of all that has been written on the diseases in question, more especially in the latest periodical literature. Here we are immediately confronted with the difficulty of knowing what to believe amidst the mass of published articles, and when we see some of the sources from which the author has only too frequently quoted, we consider that he has not had a due appreciation of the extremely untrustworthy nature of much of his material.

With this qualification then, viz. a too ready willingness to admit the statements of uncritical writers, we can only find praise for the large mass of material condensed by the author. To hope to find any general explanation of the distribution of diseases is, we think, at present premature. We may point out finally some details of particular diseases where the information is inadequate or inaccurately set forth. On p. 237, the principal carrier of malaria is said to be *A. Claviger*. This is a curious statement, seeing that it does not occur in tropical Africa, India, Malaysia, &c. Possibly the author had Europe alone in his mind. Nor should we think that Grassi holds that any species of Culex can transmit malaria. The malaria of cattle is quite a different disease from that of man, and it is not accurate to use this term in reference to pyroplasma bovis (p. 243). Again, the malarial statistics of India have been, up to the present, so notoriously untrustworthy that we doubt much the value of quoting statements about "an increased production of the poison" in famine years (p. 248). Nor is it true that the Central Provinces are among the most malarious territorial divisions of India.

Turning now to that peculiar manifestation of malaria, blackwater fever (p. 44), we note the omission of Palestine as an important focus of this disease. So virulent is it there among the Jews that some villages have been deserted. On p. 51 the author writes, "whether hæmoglobinuric fever in man is due to the same organism as the red water fever of cattle is uncertain." In our opinion it is absolutely certain that it is not, for the simple reason that this organism (pyroplasma) of cattle has a characteristic and easily recognised appearance, and exists in abundance in the blood and organs, but has never been seen or described by anybody in the blood or organs of blackwater patients. The recent commission on malaria appointed by the Royal Society has likewise shown that in the Duars (India) it is as common as in tropical Africa. Nor do we consider that an abundance of observations has been published tending to disprove Koch's views of blackwater; on the contrary, the Royal Society's commission was of precisely the same view as Koch.

Sprue (p. 127) undoubtedly exists in India, as a typical case from there in a lady came recently within our knowledge. It is quite certain, however, that the ætiology and differentiation of hill-diarrhœas in India is completely obscure at present. We have already referred to the work of the sleeping sickness commission, but it seems probable that when its complete reports are published our knowledge of the distribution of Filaria will be considerably modified.

While we have pointed out in what respect we consider this book deficient, yet it must not be thought that we have not a full appreciation for the industry which it must have necessitated; and those students who wish to possess a well-arranged book of reference on the distribution of diseases ought to be exceedingly grateful to the author, but when consulting it they should remember that the subject is hardly yet capable of accurate treatment. J. W. W. S.

HYDRODYNAMICAL FIELDS OF FORCE.

Vorlesungen über hydrodynamische Fernkrafte nach C. A. Bjerknes' Theorie. Von V. Bjerknes. Band ii. Pp. xvi+316. (Leipzig: Johann Ambrosius Barth, 1902.) Price 10 marks, or 11.50 marks bound.

THE first volume of this book, which was reviewed in NATURE for November 3, 1900, is of a theoretical character, and deals with the stream lines in a perfect liquid considered especially with reference to the motions set up by moving solids and in particular pulsating, oscillating, or moving spheres. In it were obtained results now well known to students of hydrodynamics showing the existence of attractions and repulsions between the spheres, bearing a considerable analogy to the forces occurring in gravitation and other physical phenomena.

The interest of these results is greatly enhanced by the experiments described in the present volume. These experiments were commenced in the summer of 1875 by the late Prof. C. A. Bjerknes, who observed that if two spheres lighter than water (croquet-balls were used in the first instance) are allowed to fall into a tank of water from the same height, so as to set up vertical oscillations at the surface, they will approach each other if let fall simultaneously, and will recede from each other if let fall so that their oscillations are opposite in phase. From the fact that the volumes displaced by the spheres vary, the conditions are in many ways analogous to those produced in an infinite liquid by "pulsating" rather than oscillating spheres. From this beginning more elaborate experiments were devised. A sphere falling in liquid in the neighbourhood of a vertical wall in which its image could be seen by reflection was found to reproduce the attractions and repulsions indicated by theory for a pair of spheres moving symmetrically. The next experiments were conducted with spheres so fixed as to perform pendulum oscillations below the surface. The experiments were first performed at home, but from 1876 to 1880 Prof. Schiötz arranged for their continuation in

the Physical Laboratory of Christiania, and during the last two years Mr. S. Svendsen assisted in the work. About 1880, Prof. C. A. Bjerknes received from the Norwegian Government a private laboratory, where the experiments were arranged by the author with the assistance of Mr. J. L. Andersen. The result of these facilities was the construction of an elaborate instrument for measuring the attractions and repulsions of bodies pulsating in liquid. The generator consists of a system of pumps or drums operated on as bellows by cranks worked by a handle. These alternately force air in and out of the "pulsators," which may consist either of elastic balls, drums, or similar arrangements suspended in the water by a "pulsation balance," and the whole apparatus is now supplied by Ferdinand Ernecke, of Berlin. Another form of apparatus is described suitable for studying bodies oscillating in water without change of volume. Methods are also described of rendering the stream lines visible, and diagrams are shown illustrating the resemblance of these lines to magnetic lines of force.

The description of the experiments occupies the second part of the book. The first part consists of a summary of the main results, both quantitative and qualitative, which were established in vol. i., treated by elementary methods only, and it serves the purpose of enabling the physicist to read the present volume without studying its more mathematical predecessor. For such a reader the third part will have considerable interest, for it deals with the analogy of hydrodynamical phenomena with those of electrostatics and magnetism. Prof. C. A. Bjerknes's original discussions of these analogies having been given at a transition period in the development of electrical science, the writer of the present volume has largely remodelled the arguments in order that they may be studied in the light of modern electrical views. Between hydrodynamical and electric or magnetic fields of force, a close analogy exists *except in regard to the sign of the force.* The stream lines due to spheres executing pulsations of the same phase are identical with the lines of force due to like charges, but the pulsating spheres attract one another while the electrified spheres repel one another. If the pulsations are of opposite phases, the stream lines are the same as the lines of force of oppositely charged bodies, but the force is repulsive instead of attractive. Owing to this difference, the hydrodynamical field is to be regarded as affording a representation rather than an explanation of electric and magnetic fields, and as Prof. V. Bjerknes points out, a negative representation is still a representation, and it may admit of all the uses of a positive one.

Prof. V. Bjerknes has uniformly adopted the Heaviside system of "rational" electrical units, and he points out the great simplifications that arise from the use of this system, expressing his regret that the existing units were adopted before the advantages of the rational system had been fully appreciated.

The book will be read with much interest by physicists, and the reproduction of some of the experiments in the lecture room suggests a useful aid to the teaching of electricity. G. H. BRYAN.

FARM ACCOUNTS.

The Farmer's Business Handbook. By I. P. Roberts. Rural Science Series. Pp. xiii+300. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1903.) Price 4*s.* 6*d.* net.

THIS volume of the Rural Science Series consists firstly of an elementary account of book-keeping suitable to a small farm, and secondly a discussion of such legal questions as leases, tenant right, highways, fences, mortgages, taxes, &c., with which an ordinary farmer is likely to become conversant in the course of his business. This latter portion of the book is naturally only applicable to the United States, and though succinctly and clearly written, can be of little service to the English reader. In the earlier section of the book a system of book-keeping is set out by which the farmer can ascertain not only his profit or loss as a whole, but the result of his operations on each field or in each section of his business. The usual method of double entry is employed, though only day book (for which the American equivalent is apparently "blotter") and ledger are kept. The explanations are clear and simple, and may be read with profit by students who are beginning formal book-keeping, and are getting confused over the problem of Dr. and Cr. But we are by no means convinced that the ordinary system of double entry is the best method of handling farm accounts; naturally it can be made to deal with them, and for the cash account nothing different is wanted, but it is an extremely cumbrous means of ascertaining the profit or loss on individual crops or classes of live stock. Farmers are often reproached, and justly enough, with not keeping proper accounts, but it is not quite so easy a matter as in a business where all the items are in sight. So many of the figures must be estimates depending upon the judgment of the farmer; first of all the annual stock-taking has to be a valuation, in which market fluctuations have, or have not, to be considered, according to the purpose of the account. For example, a man has a breeding flock the number of which remains constant; in ascertaining his profits upon sheep-breeding it is best to take the value of the flock as constant, but in ascertaining his financial position at a given moment, he must re-value the flock at current rates. Again, many operations upon a farm are performed as much for their contingent advantages as for immediate return; the dung and cultivations given to the root crop have their value throughout the rest of the rotation; cattle are fattened for the sake of the manure they produce.

To one point the author of this book very properly gives special prominence, the item of household expenses; the house rent, the milk, potatoes, &c., consumed, the labour spent, are very often not taken into account at all, and the farmer sometimes comes to the conclusion that his farm is not paying when he is really living beyond his income. On the whole we believe that the ideal system is to open a ledger account for all cash transactions and for the house, and to keep separate running or progress accounts against the main branches of his business, such as the dairy